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(54) INK AESORBENT AND RECORDING SHEET USING INK ABSORBENT

(57)Abstract:
PROBLEM TO BE SOLVED: To provide an ink absorbent which shows high ink absorption and optical density and also outstanding water resistance and light resistance as well as a recording sheet using this ink absorbent.
SOLUTION: This ink absorbent is characterized in that it contains mesoporous silica with an average pore diameter of 10 nm or more and 35 nm or less. In addition, the recording sheet is characterized in that it contains the described ink absorbent.

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CLAIMS

[Claim(s)]
[Claim 1] The ink absorbent characterized by containing a meso porous silica with it. [an average pole diameter larger than 10nm and] [smaller than 35nm]
[Claim 2] The ink absorbent according to claim 1 characterized by including the metal atom more than a kind as which the meso porous silica was chosen from the alkaline-earth-metal atom and the zinc atom.
[Claim 3] The ink absorbent according to claim 1 or 2 characterized by carrying out surface treatment of the meso porous silica by the silane coupling agent.
[Claim 4] The ink absorbent according to claim 1 to 3 characterized by containing at least one or more sorts of an ultraviolet ray absorbent, radical inhibitor, and a singlet oxygen quencher.
[Claim 5] The ink absorbent according to claim 1 to 4 characterized by containing the binder of a polyvinyl alcohol system.
[Claim 6] The ink absorbent slurry which consists of an ink absorbent and a solvent according to claim 1 to 5.
[Claim 7] The record sheet characterized by containing an ink absorbent according to claim 1 to 6.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the ink absorbent used for the record sheet for ink jets etc., and the record sheet using it.
[0002]
[Description of the Prior Art] By the spread of the Internet or digital cameras, the opportunity to output a high-definition full color image to paper etc. has increased. On the other hand, full-color-izing is easy for the printer by the ink jet method, and since it has the features, like there is little noise by low cost, it is spreading quickly as output equipment of these images. Although it is the method which this ink jet method injects a liquid ink drop from a nozzle at high speed, is made to adhere to a recorded material, and is recorded, since a liquid ink drop is continuously injected including a lot of solvents in ink, liquid ink drops unite mutually on a record sheet, and it is easy to produce the nonconformity that a dot spreads or a color is mixed etc. For this reason, even if it absorbs ink promptly and a dot laps, ink is not mixed with an ink jet record sheet, but moreover there is no dot blot, and it is required that it should have high optical density.
[0003] Then, spreading or inner-**(ing) are proposed by the base material with the binder in various organic substance and inorganic substances as a record sheet of an ink jet if needed. For example, the record sheet which prepared the ink absorbing layer which consists of water soluble resin, such as polyvinyl alcohol, on paper, a plastic film, etc., and the record sheet which prepared the ink absorbing layer containing fillers, such as silica gel, are known (for example, JP,55-146786,A, JP,56-99692,A, JP,59-174381,A, JP,2-276670,A, etc.). However, no they were what can be enough satisfied in respect of demand characteristics, such as the absorptivity of ink, optical density, a water resisting property, and lightfastness.

[0004]
[Problem(s) to be Solved by the Invention] With the conventional technique, the absorptivity and optical density of the ink which was not obtained are high, and this invention aims at offering the ink absorbent excellent in a water resisting property and lightfastness, and the record sheet which used them for the ink absorbent slurry list.
[0005]
[Means for Solving the Problem] That is, this invention offers the following ink absorbents of 1-7, and the record sheet which used them for the ink absorbent slurry list.
1. Ink absorbent characterized by containing meso porous silica with it. [an average pole diameter larger than 10nm and] [smaller than 35nm]
2. Ink absorbent of one above-mentioned publication characterized by including metal atom more than kind as which meso porous silica was chosen from alkaline-earth-metal atom and zinc atom.
[0006] 3. Ink absorbent the above 1 characterized by carrying out surface treatment of meso porous silica by silane coupling agent, or given in two.
4. Ink absorbent given in either of the above 1-3 characterized by containing at least one or more sorts of ultraviolet ray absorbent, radical inhibitor, and singlet oxygen quencher.
5. Ink absorbent given in either of the above 1-4 characterized by containing binder of polyvinyl alcohol system.
6. Ink absorbent slurry which becomes either of the above 1-5 from ink absorbent and solvent of publication.
7. Record sheet characterized by containing ink absorbent of publication in either of the above 1-6.
[0007] Hereafter, this invention is explained to a detail. The ink absorbent of this invention is characterized

by an average pole diameter containing a larger meso porous silica smaller than 35nm than 10nm. The meso porous silica used for the ink absorbent of this invention is the silica porous body which has an average pole diameter, and crystallinity is clearly accepted in a larger meso pore field smaller than 35nm than 10nm by the powder X diffraction, and it has uniform pore in it. As a silica content, 90 % of the weight or more is desirable, and the element which has permuted silica frames, such as impurities, such as sodium originating in a raw material and a template residue, aluminum, and titanium, has less than 10 desirable % of the weight.

[0008] Furthermore, a BET specific surface area (nitrogen adsorption specific surface area) is desirable, and the meso porous silicas used for this invention are 400-1400m2/g and a thing which it is more desirable, and 500-1000m2/g and pore volume are desirable, and has the porous structure of 1 - 4 cc/g. There is a possibility that specific surface area may become inadequate [ink absorptivity] when under 400m2/g or pore volume is less than 1 cc/g. As for mean particle diameter, it is desirable that it is 0.02-20 micrometers, and it is 0.02-10 micrometers more preferably. When mean particle diameter is larger than 20 micrometers, since the smooth nature of a record sheet may be lost, it is not desirable.
[0009] The above-mentioned property is fulfilled, and if the meso porous silica containing the metal atom more than a kind chosen from the alkaline-earth-metal atom and the zinc atom is contained, a water resisting property and lightfastness will improve further. Moreover, the above-mentioned property is fulfilled, and if the meso porous silica which carried out surface treatment by the silane coupling agent is contained, lightfaatness will improve.
[0010] The synthetic approach of the meso porous silica used for this invention will not be especially limited, if a meso porous silica with it is obtained. [an average pole diameter larger than 10nm and] [smaller than 35nm] For example, the synthesis method which made the alkoxide of a silica indicated by the U.S. Pat. No. 3556725 description the source of a silica, and made the template the quarternary ammonium salt containing long-chain alkyl can be used. Moreover, the approach of compounding with the hydrothermal crystallization method which makes the amorphous silica powder and the alkali silicate water solution with which the synthesis method is indicated by the Patent Publication Heisei No. 503499 [five to] official report etc. the source of a silica, and makes a template the quarternary ammonium salt which has a long-chain alkyl group, or phosphonium salt can also be used.
[0011] Furthermore, the approach of making sheet silicates, such as a money dynamite, a template and compounding a long-chain alkylammonium cation etc. for them by the ion-exchange method as a source of a silica indicated by JP,4-238810,A etc., can be used. In addition, the approach of compounding active silica as a source of a silica by making amines, such as a dodecyl amine and a hexadecyl amine, into a template, Or as indicated by D.Zhao's and others report [J.Am.Chem.Soc., Vol.120, P6024-6036 (1998)] The triblock copolymer which is the nonionic surfactant of the amount of giant molecules can be made into a template, and the approach of compounding in an acid field can also be taken by making the alkoxide of a silica into the source of a silica.
[0012] Especially the synthetic approach of the meso porous silica containing the metal atom more than a kind chosen from the alkaline-earth-metal atom and the zinc atom is not limited. For example, the solution or slurry containing the slurry and metal atom of the meso porous silica compounded by the synthetic approach mentioned above can be mixed, and it can obtain by self-possessed or the approach of making it react. Moreover, a metal salt etc. can be directly added to the slurry of a meso porous silica, and self-possessed or the approach of making it react can also be taken.
[0013] Or in case a meso porous silica is compounded, the approach of making a metal salt etc. adding and containing can also be taken. As a metal atom, calcium, magnesium, and zinc are desirable. As for the content of a metal atom, it is desirable to carry out 0.5-20 weight section content to the meso porous silica 100 weight section on oxide criteria, and it is 1 - 10 weight section more preferably.
[0014] Well-known silane coupling arts, such as dry process and a wet method, can be used for the approach of the surface treatment by the silane coupling agent of a meso porous silica. For example, carrying out churning mixing of the meso porous silica, the solution or slurry of a silane coupling agent can be sprayed, and the approach of making it adhere or react can be used. Moreover, the approach of mixing to the slurry of a meso porous silica and making a silane coupling agent or its solution, and a slurry adhering or reacting to it can also be used.
[0015] In case a meso porous silica is compounded, surface treatment of the silane coupling agent can also be added and carried out. For example, it is compoundable by substituting 3-aminopropyl triethoxysilane, methyl triethoxysilane, etc. for a part of tetra-ethoxy silane which is the alkoxide of the silica used as a

source of a silica at the time of composition.
[0016] Although which a well-known silane coupling agent is sufficient as the silane coupling agent used for this invention, its silane coupling agent which has the functional group which is not high out of hydrophobicity is conventionally desirable. As a concrete functional group, the amino group, an epoxy group, the 4th class-ized ammonium salt radical, a sulfhydryl group, a glycidoxy radical, or an methacrylic radical is desirable. Especially, the amino group and the 4th class-ized ammonium salt radical are more desirable. The silane coupling agent used in this invention may be independent, or two or more sorts may be combined, and it is desirable 0.2 - 20 weight section and to use at a rate of 1 - 15 weight section more preferably to the meso porous silica 100 weight section.
[0017] Although especially the content of the meso porous silica of the ink absorbent of this invention is not limited by the activity gestalt, 10% of the weight or more of its content is desirable. It is containing 30% of the weight or more more preferably. Although not limited especially as other components, a binder, a pigment, etc. can be used according to the purpose of use and a gestalt. As a binder, the organic substance with water soluble resin, such as starch, and the denaturation object, polyvinyl alcohol (Following PVA is called), its denaturation object, conventionally well-known a latex, an emulsion, etc. can be used.
[0018] It is desirable to use a PVA system binder especially. As a PVA system binder, the usual others and cation denaturation PVA and the usual silanol denaturation PVA of PVA may be used. A binder is usually used in the range of the 5 - 300 weight section to the meso porous silica 100 weight section in an ink absorbent. As said pigment, silica gel, a calcium carbonate, a kaolin, a zeolite, an alumina, etc. are raised.
[0019] Moreover, it can respond to the component contained in [other than the above-mentioned binder and a pigment] an ink absorbent in activity eye, and well-known additives, such as an ultraviolet ray absorbent, radical inhibitor, a singlet oxygen quencher, a fading inhibitor, a deck-watertight-luminaire-ized agent, a dispersant, a thickener, and a defoaming agent, can be used.
[0020] As a deck-watertight-luminaire-ized agent, SUMIRE gap gin 1001 (Sumitomo Chemical trade name), KSR-100K (Sanyo Chemical Industries trade name), etc. can be used for cationic resin, such as polyethyleneimine, a polyamide urea-resin, and polyamide resin, and a concrete target, for example.
[0021] Since lightfastness will improve if at least one or more sorts in an ultraviolet ray absorbent, radical inhibitor, and a singlet oxygen quencher (these are hereafter called a stabilizing agent.) are included especially, it is desirable.
[0022] If it is effective in lightfastness improving and there is effectiveness of degradation prevention in order that the stabilizing agent used for this invention may prevent degradation of the ink which was printed and was absorbed by the ink absorbent fading, especially the class will not be limited. Moreover, many can be used although the optimal thing naturally changes with the ink used for printing, or its degradation devices, and used for degradation inhibitors, such as a polymer and color photography. It may add independently or these stabilizing agents may be used combining each. Moreover, you may have the structure which shows the effectiveness of ultraviolet absorption, radical prohibition, and singlet oxygen quenching in the same compound.
[0023] Especially as an effective thing of ultraviolet absorption, although not limited, as an organic substance system, a salicylic-acid system, a benzophenone system, a bends triazole system, a cyanoacrylate system, a benzoate system, a hindered amine system, etc. are mentioned, and the particle of metallic oxides, such as titanium oxide, cerium oxide, and a zinc oxide, is mentioned as an inorganic substance system. That in which the compound itself does not soil a white ground by colorlessness, but the light stability of this self is moreover excellent is desirable, and a benzotriazol system is the most desirable.
[0024] As an effective thing of radical prohibition, although phenol systems, such as a mono-phenol system, a bisphenol system, and a macromolecule mold phenol system, a hydroquinone system, an organic sulfur system, a phosphite system, and an amine system are mentioned, a hydroquinone system is the most desirable. As an effective thing of singlet oxygen quenching, although an aniline derivative, an organic nickel system, a SUPIRO chroman system, a SUPIRO in out system, etc. are mentioned, an aniline derivative is the most desirable.
[0025] as a stabilizing agent -- concrete --- Sumi Reiser, SUMISOBU (Sumitomo Chemical trade name), an ADEKA stub (Asahi electrification trade name), IRGANOX, TINUVIN (tiba speciality chemicals trade name), OHM-SP, and 88 --- HQ, TSB (Fuji Photo Film trade name), need RARU (Taki Chemical trade name), zinc-oxide ultrafine particle ZnO-305 (Sumitomo Osaka Cement trade name), etc. can be used.
[0026] Although especially the addition of the stabilizing agent in this invention is not limited, when there is little effectiveness of preventing degradation of ink if too few and there is, there is a possibility of

deteriorating engine performance, such as resolution as an ink absorbent and a water resisting property. [too much] Therefore, the addition has desirable 0.01 weight section - 10 weight section to the meso porous silica 100 weight section, and is 0.1 weight section - 5 weight section more preferably.

[0027] As an approach of adding a stabilizing agent, there are an approach which an ink absorbent is made to distribute to homogeneity, and an approach which an ununiformity is made to distribute to an ink absorbent. As an approach which homogeneity is made to distribute, there is the approach of adding in the phase of an ink absorption slurry etc. Distributing an ununiformity is the object which prevents more effectively degradation of the ink absorbed by the ink absorbent fading, and since the required part of an ink absorbent or a record sheet is distributed by high concentration, it is performed.

[0028] Especially as an approach which an ununiformity is made to distribute, although it does not limit, the following approaches are mentioned. How to remove a solvent or mix with a binder etc. in the condition as it is, after adding a stabilizing agent in the liquid which distributed the meso porous silica to solvents, such as alcohol, and making a meso porous silica stick to it as an approach of adding selectively to the meso porous silica in an ink absorbent at high concentration. On the other hand, after adding a stabilizing agent in the liquid which distributed or dissolved the binder in the solvent and making a binder stick to a binder as an approach of adding to high concentration selectively, the approach of mixing a solvent with a meso porous silica etc. in the state of [as it is] clearance is raised.

[0029] Moreover, the approach of applying the ink absorbent slurry which prepares the ink absorbent agent slurry which contains a stabilizing agent in high concentration and low concentration, applies the ink absorbent slurry which contains a stabilizing agent in a base material first at low concentration, and contains a stabilizing agent in a near side on it after that as an approach of adding to high concentration on the surface of a record sheet at high concentration is raised. In addition, or a stabilizing agent is not included in a base material at all, after applying the ink absorbent slurry included in low concentration, the approach of applying the solvent containing a stabilizing agent or carrying out impregnation is also possible.

[0030] The configurations of the ink absorbent of this invention may be fine particles, may be a massive object, or may be a letter object of kneading, and a configuration will not be limited, if the front face of base materials, such as a synthetic-resin film and paper, is coated, or it inner-** and it can consider as an ink absorption element.

[0031] In the record sheet of this invention, the front face of base materials, such as a synthetic-resin film and paper, is coated with the ink absorbent mentioned above, or it is inner-**(ed), and let it be an ink absorption element. A synthetic-resin film or paper is raised as a base material to be used. As a synthetic-resin film, polyester, polyolefine, a polyamide, polyester amide, a polyvinyl chloride, etc. can be used, for example. Furthermore, these copolymers and blend objects, the thing which constructed the bridge or the film which scoured the pigment, and was [the pigment] full and opacificated it, a foaming film, a gloss film, etc. can also be used.

[0032] the inside of the above-mentioned base material -- polyester -- polyethylene terephthalate is preferably desirable from points, such as a mechanical property and workability. Moreover, as paper, paper of fine quality, a report grade paper, art paper, a cast-coated paper, coated paper, a synthetic paper, resin coat paper, etc. can be used, for example. Cloth, such as cotton, rayon, and an acrylic, a glass plate, a metal, etc. can be used according to an application besides a synthetic-resin film and paper. Although especially a limit does not have the thickness of a base material, many 10-200-micrometer things are usually used.

[0033] a means to coat a base material front face with an ink absorbent -- for example, an ink absorbent -- various kinds, such as a die coating machine, a roll coater, a rod coating machine, a blade coating machine, and an air knife coating machine, -- it can apply using a well-known approach and the approach of drying can be used. Moreover, the spray method and shaping side which spray the dip coating method immersed in an ink absorbent in a base material and an ink absorbent on a base material can be coated with an ink absorbent, and the approach of imprinting to a base material etc. can also be used.

[0034] In case it coats, the slurry which mixed the ink absorbent and the solvent can be used. Although the slurry which mixed the ink absorbent and the solvent may mix the constituent and solvent of an ink absorbent simultaneously, after it prepares independently the dispersion liquid of the meso porous silica which is the constituent of an ink absorbent, and the liquid which distributed the binder which is the other constituent, it can double both, can make them a slurry and can also be used for coating.

[0035] Although especially the solvent used for an ink absorbent slurry is limited neither with the coating approach nor the binder to be used, various well-known organic solvents and water, such as alcohols, such

as ethanol and isopropyl alcohol, an acetone, and a methyl ethyl ketone, can be used for it. Although the content of the ink absorbent in an ink absorbent slurry is changed according to the coating approach or an activity gestalt and is not limited especially, 5% of the weight or more of its content is desirable, and it is desirable to contain 10 % of the weight or more more preferably.
[0036] A base material can improve the coating nature of an ink absorbent, an adhesive property, etc. if needed by carrying out well-known surface preparation, such as corona discharge treatment and priming, in air or other ambient atmospheres before coating. Moreover, you may carry out coating both sides of a base material with which a multilayer is coated, or carrying out the laminating of the layers from which physical properties differ, such as a protective layer, and a gloss layer, a glue line, etc.
[0037] 1-100-micrometer 5-50-micrometer 5-30 micrometers are more preferably suitable for the thickness of coating preferably. The content of the meso porous silica in a coating layer has desirable 0.5 - 30 g/m2, and it is 0.5-15g/m2 more preferably. The absorptivity of ink may be insufficient if the content of a meso porous silica becomes less than [0.5g //m] two.
[0038] An ink absorbent can be inner-**(ed) to a base material, and, in the case of paper, the approach of adding and carrying out paper making of the slurry containing said ink absorbent or an ink absorbent to the slurry for paper making can be used for the means. Moreover, an ink absorbent can be mixed with synthetic resin etc. and the approach of fabricating the shape of a film and in the shape of a sheet by the casting method, the extrusion method, the calender method, etc. can also be used. As synthetic resin, although there is especially no limit, they are vinyl alcohol system resin, acrylic resin, urethane system resin, amino acid system resin, etc., and its permeable high thing is desirable. The content of the meso porous silica on the basis of the whole sheet has 0.5 - 30 desirable % of the weight.
[0039]
[Embodiment of the Invention] Although an example is given below and the gestalt of operation of this invention is explained concretely, this invention is not restricted at all by this example. In addition, in the example, an average pole diameter, pore volume, and specific surface area were measured with nitrogen using auto SOBU -1 made from can TAKUROMU. It asked for specific surface area with the BET adsorption method. mean particle diameter -- Shimadzu Make -- it measured by laser diffraction type particle-size-distribution meter SALD-1100. The silica content of the sample after 550-degree-C baking calculated the silica content in a meso porous silica from the weight difference before and behind 550-degree-C baking as 100%. The content of the meso porous silica in an ink absorbent layer was calculated from the weight ratio of the weight after desiccation of the coated ink absorbent layer, the meso porous silica taught into the slurry, and a binder.
[0040] Moreover, at this example, the following approaches estimated the printing property. Yellow, MAZENDA, cyanogen, black, Green, red, and the thing that performed blue solid printing were used for the created record sheet with the commercial ink jet printer (the Seiko Epson make, PM-750C).
[0041] Evaluation criteria are shown below.
1) Printing nature : the visual judgment of crawling of the ink of the printing section and extent of a blot of a boundary line was carried out.
O :-blot-less ** : spread a little. 2 ink drying which becomes in x: and spreads: Extent of a presser foot and an imprint of ink of the printing section with a blank paper was judged immediately after printing.
O **[imprint-less]: with no imprint after 90 seconds after [of :] 60 seconds after [of x:] 90 seconds -- imprint 3 water-resisting-property: -- after dipping the printed record sheet underwater for 2 minutes, it dried at the room temperature and the visual judgment of a blot of ink and extent of a spill was carried out.
O : ink flow minimum O:ink flow smallness **: Inside of ink flow x: Ink flow size [0042] 4) Lightfastness : table-top-type accelerated-weathering exposure equipment SANTESUTO CPS+ (product made from an Oriental energy machine) was used for the printed record sheet, and it was irradiated on condition that the black panel temperature of 60 degrees C, a window glass filter activity, and irradiance 765 W/m2. The optical density of the black before and behind a 60-hour exposure was measured, and the rate of change of concentration was searched for. Measurement of optical density was performed using the reflection density meter (made in GURETAGU Macbeth, RD-918).
O the degree smallness of :fading whenever [O:fading] -- inside whenever [x:fading] -- large 5 printing concentration: -- the optical density of the printing section of black -- the GretagMacbeth make -- it measured by reflection density meter RD-918.
[0043]
[Example] Pluronic which it considers as a template at 662g of example 1 water, and is triblock copolymer of

ethylene oxide and propylene oxide 25g and 125ml of hydrochloric acids were added, and the churning dissolution of P123 (BASF A.G. make) was carried out at 35 degrees C. It added agitating 37.5g 1,3,5-trimethylbenzene to this. It added agitating tetra-ethoxy silane 52g furthermore, agitated at 35 degrees C for 20 hours, and put at 80 degrees C for 48 hours. The obtained complex was filtered, it was air-dry after rinsing for 48 hours, and the complex powder of a silica and a template was obtained. This powder was distributed to ethanol, and it processed and filtered at 60 degrees C. This actuation was repeated 5 times. Subsequently, it dried at 70 degrees C after the air dried with the room temperature, and the meso porous silica was obtained.

[0044] The peak was looked at by d value =14.7nm in X diffraction drawing of this sample (Sample A is called hereafter). The Seishin Enterprise jet mill ground Sample A, and the sample with a mean particle diameter of 6.7 micrometers was obtained (a sample A1 is called hereafter). The specific surface area of a sample A1 was [the average pole diameter of 1.13 cc/g and a meso pore field of 530m2/g and pore volume] 15.0nm.

[0045] Water was mixed with the sample A1 and dispersion liquid of 16.7 % of the weight of meso porous silica concentration were created. The 10-% of the weight water solution of the 10-% of the weight water solution and the silanol denaturation PVA of Cation PVA was mixed with this, and the meso porous silica, Cation PVA, and the weight ratio of the silanol denaturation PVA prepared the ink absorbent slurry of 13.3 % of the weight of solid content by 10:3:3. On the sheet made from polyethylene terephthalate (100 micrometers in thickness), spreading desiccation of said slurry was carried out, the sheet for record which prepared the ink absorbent layer with a thickness of about 40 micrometers was obtained, and the bar coating machine estimated the printing property on it. The assessment result was shown in a table 2. The contents of a meso porous silica were about 13 g/m2.

[0046] In example 2 example 1, the meso porous silica was similarly obtained except having changed the amount of 1,3,5-trimethylbenzene into 50g. The peak was looked at by d value =21.6nm in X diffraction drawing of this sample (Sample B is called hereafter). The Seishin Enterprise jet mill ground Sample B, and the sample with a mean particle diameter of 6.2 micrometers was obtained (a sample B1 is called hereafter). The specific surface area of a sample B1 was [the average pole diameter of 1.23 cc/g and a meso pore field of 520m2/g and pore volume] 23.0nm. The outside which used this sample B1 instead of the sample A1 obtained the record sheet like the example 1, and performed printing characterization. The assessment result was shown in a table 2.

[0047] In example 3 example 1, the meso porous silica was similarly obtained except having changed standing temperature into 95 degrees C from 80 degrees C. The peak was looked at by d value =29.4nm in X diffraction drawing of this sample (Sample C is called hereafter). The Seishin Enterprise jet mill ground Sample C, and the sample with a mean particle diameter of 5.2 micrometers was obtained (a sample C1 is called hereafter). The specific surface area of a sample C1 was [the average pole diameter of 1.82 cc/g and a meso pore field of 510m2/g and pore volume] 32.0nm. The outside which used this sample C1 instead of the sample A1 obtained the record sheet like the example 1, and performed printing characterization. The assessment result was shown in a table 2.

[0048] The 10 % of the weight slurry of solid content was made from example 4 sample B1 and water, after adding a magnesium chloride and 6 hydrate of 5 weight sections and carrying out churning processing by magnesium-oxide conversion to the 100 weight sections of a sample B1 for 30 minutes on oxide criteria into it, it dried at 70 degrees C and the mortar ground. The outside which used this sample instead of the sample A1 obtained the record sheet like the example 1, and performed printing characterization. The assessment result was shown in a table 2.

[0049] The 10 % of the weight slurry of solid content was made from example 5 sample B1 and water, and after adding 3-aminopropyl triethoxysilane (made in formation [Tokyo]) of 5 weight sections and carrying out churning processing to the 100 weight sections of a sample B1 for 1 hour into it, the sample which dried and carried out surface treatment at 70 degrees C was obtained. The outside which used this sample instead of the sample A1 obtained the record sheet like the example 1, and performed printing characterization. The assessment result was shown in a table 2.

[0050] The 20 % of the weight slurry of solid content was made from example 6 sample B1 and ethanol, and the methyl cel RORUBU solution was added 1.5% of the weight, and it mixed so that octadecyl dimethyl [3-(trimethoxysilyl) propyl] ammoniumchloride (product made from Torre silicone) might become 10 weight sections to the 100 weight sections of a sample B1 into it. The sample which dried and carried out surface treatment of this at 110 degrees C was obtained. The outside which used this sample instead of the sample

A1 obtained the record sheet like the example 1, and performed printing characterization. The assessment result was shown in a table 2.

[0051] Using the sample B1 instead of seven to example 9 sample A1, the outside which added the stabilizing agent shown in a table 1 obtained the sheet for record like the example 1, and performed printing characterization. The assessment result was shown in a table 2. In addition, in a table 1, the weight section to the 100 weight sections of a sample B1 showed the addition.

[0052] 172.5g (2= 29 % of the weight of SiO(s), Na2O=9.5 % of the weight) of the example No. 13 water glass of a comparison was diluted with 327.5g of water, the column filled up with the cation exchange resin (Amberlite, IR-120B) beforehand used as H+ mold was passed, and 350g of active silica water solutions was obtained. SiO2 of this active silica water solution was 8.3 % of the weight. The hexadecyl amines 10.9g and 1, 3, and 5 triisopropyl benzene 28.2g were dissolved in ethanol 76.8g, and the 100g of the above-mentioned active silica water solutions was added, agitating subsequently. This mixture (Sample D is called hereafter).

[0053] The peak was looked at by d value =7.8nm in X diffraction drawing of Sample D. The wet ball mill ground Sample D and the sample with a mean particle diameter of 9 micrometers was obtained (a sample D1 is called hereafter). The specific surface area of a sample D1 was 690m2/g, and the average pole diameter was 7.0nm. The outside which used D1 instead of the sample A1 obtained the sheet for record like the example 1, and evaluated the printing property. The assessment result was shown in a table 2.

[0054] Instead of the sample A1 of examples of comparison 2 example 1, silica gel (the product made from Fuji SHIRISHIA Chemistry, trade name SAISHIRIA 350, average pole diameter of 21nm) was used, and others obtained the record sheet which prepared the ink absorbent layer with a thickness of about 30 micrometers similarly, and performed printing characterization. The assessment result was shown in a table 2.

[0055] Instead of the sample A1 of example of comparison 3 example 1, silica gel (the product made from Fuji SHIRISHIA Chemistry, trade name SAISHIRIA 550, average pole diameter of 7nm) was used, and others obtained the record sheet which prepared the ink absorbent layer with a thickness of about 30 micrometers similarly, and performed printing characterization. The assessment result was shown in a table 2.

[0056]

[A table 1]

表　1

	安定化剤		添加量
実施例7	チヌビン384(チバ・スペシャルティ・ケミカルズ)	ベンゾトリアゾール系紫外線吸収剤	2
実施例8	88HQ(富士写真フィルム)	ハイドロキノン系ラジカル禁止剤	2
実施例9	4－(4'－オクチルオキシフェニル)－1, 1－ジオキシチアモルホリン	アニリン誘導体系一重項酸素消光剤	2

[0057]

[A table 2]

表　2

	印字性	インク乾燥性	耐水性	耐光性	光学濃度
実施例1	○	○	○	△	1.78
実施例2	○	○	○	△	1.82
実施例3	○	○	○	△	1.71
実施例4	○	○	△	○	1.87
実施例5	○	○	◎	△	1.84
実施例6	○	○	◎	△	1.82
実施例7	○	○	○	○	1.73
実施例8	○	○	○	○	1.75
実施例9	○	○	○	○	1.74
比較例1	○	○	○	△	1.46
比較例2	○	○	×	×	1.65
比較例3	△	△	×	×	1.81

[0058]

[Effect of the Invention] There is effectiveness that the absorptivity and optical density of ink are high, and

a water resisting property and lightfastness are excellent in the record sheet containing the ink absorbent of this invention, and it.

[Translation done.]